

A.V. Balatsky  
Los Alamos National Laboratory

### Dirac Materials

Recently a new single layer material -- graphene has been discovered. This is a material where Dirac points in the fermionic spectrum lead to very unusual properties, such as transport properties and impurity states. We will argue that these properties are not unique to graphene and in fact are a direct consequence of Dirac spectrum in fermionic excitation sector. Strong similarities with d-wave superconductors, superfluid  $^3\text{He}$ , p-wave superconductors and with other materials exhibiting Dirac electronic spectrum are suggestive and offer a unifying perspective. We will argue that this discovery signifies the emergence of a new class of materials that can be called "Dirac Materials," the class where nontrivial properties emerge as a direct consequence of Dirac spectrum of excitations. We will address the local electronic properties of graphene such as impurity states, electronic inhomogeneity and discuss broad similarities with Dirac physics seen in other materials. We will also discuss the inelastic electron tunneling spectroscopy (IETS) and role of phonons in Dirac Materials.